

Applicant: Daniel F. Lawless  
Application No.: 10/722,629  
Filing Date: November 28, 2003  
Reply to Office Action of: December 27, 2004  
Amendment Date: January 4, 2005

### **AMENDMENTS to the CLAIMS**

This listing of claims replaces all prior versions and listings of claims in the application:

#### **Listing of Claims:**

**Claims 1 – 7 (cancelled).**

**Claim 8 (currently amended):** A Dragless Flight Control System for controlling the flight of a flying object while minimizing drag, said control system residing in said object and said object being defined by an exterior skin and having a guidance computer therein for generating new positional command signal as set forth in claim 7, said control system comprising: wherein said rotating means comprises: at least one pair of first housing and second housing, said housings being recessed inside said flying object and each having an opening communicating with said exterior skin; at least one pair of first and second fins positioned inside said housings, respectively, said fins each having a front end and a back end and being exposable outside said exterior skin and being completely retractable into said housings through said openings, said first and second fins being mounted to rotate in mutually opposite directions and to have rotation vectors normal to said exterior skin, said fins further being rotatable by variable corrective angles; a means for ascertaining current rotational position of said fins; an electronic controller coupled between said ascertaining means and said guidance computer, said controller generating a signal representative of a corrective angle in response to current rotational position information from said ascertaining means and said command signal from said computer, said controller then further producing a voltage command corresponding to said corrective angle; a drive motor coupled to said electronic controller to receive said voltage command and generate a corresponding torque; a motor drive gear; a motor transmission coupled between said drive motor and said motor drive gear to multiply said torque selectively prior to delivering said torque from said drive motor

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to said motor drive gear; a first fin gear shaft and a second fin gear shaft, said fin gear shafts being rotationally coupled to their respective fins so as to allow said fins to rotate; a first fin gear coupled between said first fin gear shaft and said motor drive gear to transmit said torque from said motor drive gear to said first fin gear shaft to enable said first fin gear shaft to rotate said first fin; ~~and~~ a second fin gear coupled between said second fin gear shaft and said motor drive gear to transmit said torque from said motor drive gear to said second fin gear shaft to enable said second fin gear shaft to rotate said second fin, said first and second fins always rotating simultaneously but in opposite directions, thereby exposing one fin while retracting the other fin until said corrective angle is obtained, thereby achieving desired degree of control of said object's flight.

**Claim 9 (currently amended)** A Dragless Flight Control System as set forth in claim 8, wherein said control system ~~rotating means~~ further comprises two O-ring seals, each seal being coupled to one of said fin gear shafts inside its corresponding housing to render stability to said fin gear shaft.

**Claim 10 (currently amended)** A Dragless Flight Control System as set forth in claim 9, wherein said control system ~~rotating means~~ still further comprises a transmission shaft coupled between said motor transmission and said motor drive gear.

**Claim 11 (original)** A Dragless Flight Control System as set forth in claim 10, wherein said means for ascertaining current rotational position of said fins is a hall sensor located in said drive motor, said sensor deriving said current rotational position by counting hall pulses generated by said motor.

**Claim 12 (currently amended)** A Dragless Flight Control System as set forth in claim 11, wherein said flight control system still further comprises several pairs of said fins, said several pairs being deployed at regular intervals around the circumference of said flying object.

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- Claim 13 (original)** A Dragless Flight Control System as set forth in claim 12,  
wherein said fin gear shafts are positioned to be coupled to said front ends of their  
respective fins.
- Claim 14 (original)** A Dragless Flight Control System as set forth in claim 13,  
wherein said fins are positioned with respect to each other such that said back ends  
are further apart than said front ends.
- Claim 15 (withdrawn)** A Dragless Flight Control System as set forth in claim 13,  
wherein said fins are positioned with respect to each other such that said front ends  
are further apart than said back ends.
- Claim 16 (withdrawn)** A Dragless Flight Control System as set forth in claim 6,  
wherein said first and second fins are positioned staggered with respect to each other.
- Claim 17 (withdrawn)** A Dragless Flight Control System as set forth in claim 16,  
wherein rotating means comprises: a first motor drive gear; a second motor drive  
gear; a motor transmission coupled between said drive motor and said motor drive  
gears to multiply said torque selectively prior to delivering said torque to said motor  
drive gears; a first fin gear shaft and a second fin gear shaft, said fin gear shafts being  
rotationally coupled to their respective fins so as to allow said fins to rotate; a first fin  
gear coupled between said first fin gear shaft and said first motor drive gear to  
transmit said torque from said first motor drive gear to said first fin gear shaft to  
enable said first fin gear shaft to rotate said first fin; and a second fin gear coupled  
between said second fin gear shaft and said second motor drive gear to transmit said  
torque from said second motor drive gear to said second fin gear shaft to enable said  
second fin gear shaft to rotate said second fin, said first and second fins always  
rotating in opposite directions, thereby exposing said first fin while retracting said  
second fin.